

## OCCLUSIVE THERAPY FOR MONOCULAR ANISOMETROPIC AMBLYOPIA IN SCHOOLCHILDREN

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**SUMMARY** – The aim of this study was to test the efficacy of home occlusive therapy under parents' supervision in schoolchildren without orthoptic-pleoptic treatment. Amblyopia is a symptom that occurs without organic disease but manifesting with reduced vision on one eye that is impossible to correct with eyeglasses or contact lenses. Being accompanied by cortical suppression, most amblyopia cases are caused by unequal refractive errors or strabismus. The treatment of amblyopia in older children (age over 8 years) has worse results as compared with younger children. Home therapy with eye patches and proper vision corrections (eyeglasses or contact lenses) should be one of therapeutic modalities as an attempt at monocular amblyopia treatment to reach better visual acuity. Fifty children, 21 (42%) boys and 29 (58%) girls aged 6-16 (mean age 12.7) years with correction differences on two eyes between 1 and 14 D were observed during a 5-year period (2001-2006). Right eye and left eye amblyopia was recorded in 28 and 22 patients, respectively. Spheric equivalent was used in cases with astigmatism. Instruction for home practice was to cover the eye with better vision twice a day for one hour under parents' supervision. The difference between the initial and final visual acuity was significant (Pearson's correlation 0.77;  $df=49$ ;  $p<0.05-0.01$ ). Student's t-test confirmed these results. The method can be accepted as therapeutic approach in children over 7 years of age.

**Key words:** *Amblyopia; Eye occlusion; Schoolchildren*

### Introduction

Good visual acuity is crucial for proper physical and mental development of children. Equal information input *via* visual pathway on both eyes is essential for development of the brain visual center<sup>1</sup>. If visual acuity on one eye is normal (visus 1.0 or 60/60), visual acuity on the other eye should be at least 0.3 (or 20/60) to achieve proper development of binocular function<sup>2</sup>.

Amblyopia is a symptom that is present on one or both eyes, manifesting with reduced visual acuity on one or both eyes, without the presence of organic disease<sup>3</sup>. Amblyopia is accompanied by cortical suppression, usually caused by unequal refractive error or strabismus. In patients with strabismus, the strabismic eye has suppressed visual acuity and deep perception<sup>4</sup>. Diseases

such as cataract, corneal disorders or palpebral ptosis may be the cause of this disease. Vitamin B insufficiency, tobacco or alcohol intoxication may result in amblyopia. Heredity as a predictable factor may have a role in this disorder which shows predominance in male children<sup>1</sup>.

According to the cause, amblyopia can be strabismic, anisometropic, due to stimulus deprivation, isoametropic amblyopia and meridional amblyopia<sup>6</sup>. Anisometropic amblyopia is caused by different refractive errors even if the difference is only one diopter. The lower best corrected visual acuity is a consequence of visual deprivation or abnormal binocular interaction without eye disease or visual pathway<sup>1</sup>. The diagnosis of anisometropic amblyopia is based on visual acuity measurements with charts (Snellen charts, Landolt test, etc.). Visual acuity with the best corrected difference between two eyes, two rows or more in charts, without organic lesion, is suggested for amblyopia. Patients with diagnosed amblyopia could more easily read single letters or symbols

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instead in line. This phenomenon is called crowding and can be found even in healthy people but is much more common in amblyopia.

The treatment of amblyopia should be started as early as possible because at age 7-8 it may become irreversible unless treatment is initiated as needed<sup>6</sup>. Treatment should be provided at a pleoptic therapy department (active treatment of functional amblyopia to achieve macular dominant function). Those children that cannot attend the treatment daily should be treated by home practice. There are two modes of treatment: one eye occlusion for all day or a few hours, which is correlated with patient age and grade of amblyopia; and penalization method where atropine drops are instilled in the normal eye and usually used in amblyopia of lower grade. On one eye the occlusive method can reveal a lower degree of visual acuity from time to time, and therefore visual acuity should also be controlled on both eyes. Penalization method has no advances over the method of better eye occlusion in the management of amblyopia.

### Patients and Methods

Fifty children aged 6-16 (mean age 12.7) years diagnosed with one eye anisometric amblyopia were included in the study. None of the children had been treated at orthoptic-pleoptic department prior to this therapeutic approach. There were 21 (42%) boys and 29 (58%) girls. Anisometric amblyopia of the right eye was present in 28 and of the left eye in 22 patients. The study was conducted during a 5-year period (2001-2006). Medical documentation was obtained from the Health Documentation Database at Eye Polyclinic, Public Health Institute in Tuzla, Bosnia and Herzegovina. Visual acuity was determined with Snellen tables from 6-meter distance with or without corrections (eyeglasses or contact lenses). Pleoptic examination was not performed due to the lack of equipment but cover test was used to test the possible existence of bulbomotor disorders. The values of visual acuity were determined initially and two years after treatment. Patients were followed-up every four months. Occlusive therapy was used as one-eye patch (cotton-wool or piece of paper) occlusion on better eye twice a day for one hour, under parents' supervision.

Results were analyzed descriptive and correlative statistics; significance was tested by Pearson's correlation and Student's t-test ( $p < 0.05$ ).

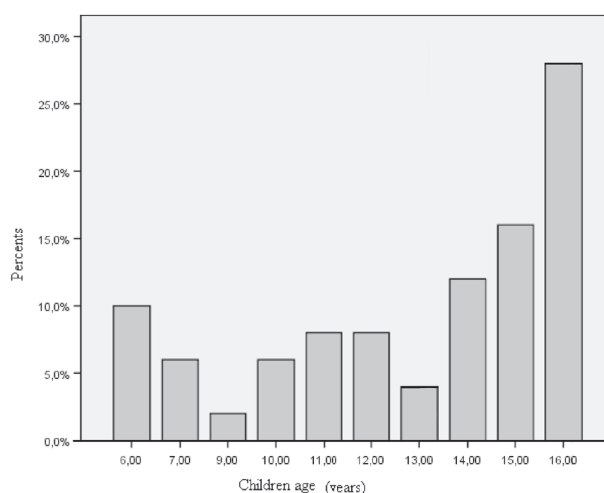


Fig. 1. Children age structure ( $n=50$ ) and percentile presentation according to years.

### Results

Fifty children, 21 boys and 29 girls, were included in the study. The girls showed considerably greater motivation to achieve good therapeutic results and higher interest in the method, and proved more responsible to comply with the procedure protocol (follow up visits). The greatest proportion of children were aged 16 (28%), while only 2.5% were aged 9. The mean age of study children was 12.7 years (Fig. 1).

Visual acuity was corrected with eyeglasses in 42 (84%) children and with contact lenses in eight (16%) children.

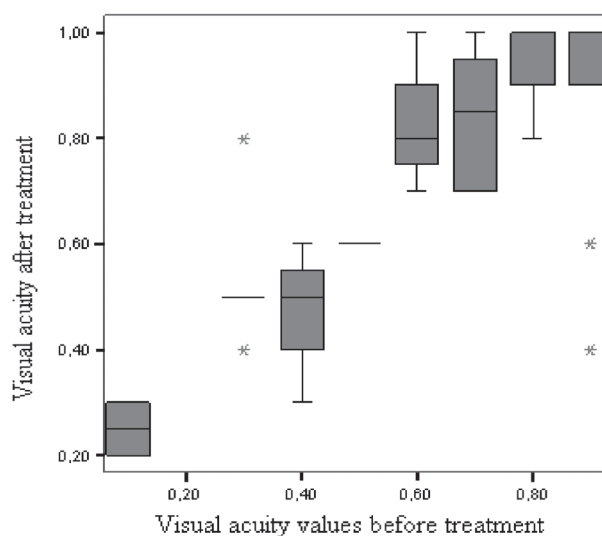


Fig. 2. Box-plot presentation of visual acuity values before and after treatment.

Table 1. Results of t-test presentation before and after better eye occlusive therapy: one-sample test

	t-test	df	Significance ( $p < 0.000$ )	t-test	
				Mean visual acuity before and after treatment	95% Confidence Before treatment    After treatment
Visual acuity before treatment	21.314	49	0.000	0.68800	0.6231    0.7529
Visual acuity after treatment	24.860	49	0.000	0.80200	0.7372    0.8668

Pearson's correlation confirmed significant visual acuity differences before and after occlusive treatment (Pearson's correlation 0.777;  $df=49$ ;  $p < 0.05-0.01$ ). Student's t-test confirmed significant difference in the mean visual acuity before and after treatment (t-test positive confirmed with 0.75 mean visual acuity before and 0.86 mean visual acuity after treatment) (Fig. 2, Table 1).

The results achieved in anisometropic amblyopia with better eye occlusion showed a significant difference in visual acuity on the worse eye before and after treatment.

## Discussion

Schoolchildren diagnosed with anisometropic amblyopia are usually controlled by an ophthalmologist at polyclinical practice instead of attending daily pleoptic department. Their possibilities are limited due to distant place of residence or the lack of interest in the approach to the problem. According to Čupak *et al.*<sup>9</sup>, pleoptic treatment has sense up to 10 years of age. Tomac and Birdal<sup>7</sup> as well as Baddini-Caramelli *et al.*<sup>10</sup> report on the results of occlusive treatment in children aged 7-8 years. According to our results, the age limit for occlusive therapy could be changed to 15-16 years in schoolchildren with monocular anisometropic amblyopia (in our group, the mean age was 12.5 years).

## Conclusion

Occlusive treatment for anisometropic amblyopia in schoolchildren could be administered at home under parents' supervision. Parents should receive appropriate

information on the method and the child should be the most important factor in applying the procedure at home. Serious approach in this method can result in satisfaction with better visual acuity when tested in ophthalmologist office in polyclinical setting. To do something is much more than to do nothing – this could be the message for this therapeutic approach.

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## Sažetak

## OKLUZIVNA TERAPIJA MONOKULARNE ANIZOMETROPNE AMBLIPIJE KOD ŠKOLSKE DJECE

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Cilj studije bio je ispitati učinkovitost okluzivne terapije pod roditeljskim nadzorom kod školske djece bez ortoptičnog-pleoptičnog liječenja. Ambliopija je simptom koji se javlja bez organskog uzroka, a očituje se smanjenjem vida na jednom oku koje nije moguće ispraviti naočalama ili kontaktnim lećama. Ovaj simptom je praćen kortikalnom supresijom. U većini slučajeva ambliopija je uzrokovana nejednakim refrakcijskim greškama ili strabizmom. Liječenje ambliopije ima lošije rezultate kod starije djece (u dobi iznad 8 godina) u usporedbi s mlađom djecom. Jedan od načina liječenja ambliopije je kućno liječenje pokrivanjem oka i primjerenim ispravljanjem vida (naočalama ili kontaktnim lećama) radi postizanja bolje vidne oštine. U ovoj studiji je 50 djece, 21 (42%) dječak i 29 (48%) djevojčica, u dobi od 6 do 16 godina (srednje dobi 12,7 godina) promatrano tijekom 5 godina (2001.-2006.) uz razlike korekcije na oba oka od 1-14 D. Ambliopija desnog oka zabilježena je u 28 bolesnika, a lijevog oka u 22 bolesnika. U slučajevima s astigmatizmom primijenili smo sferični ekvivalent. Upute za kućnu terapiju obuhvaćale su pokrivanje oka s boljim vidom dvaput na dan kroz jedan sat pod roditeljskim nadzorom. Zabilježena je značajna razlika između početne i završne vidne oštine (Pearsonov koeficijent korelacije 0,77;  $df=49$ ;  $p<0.05-0.01$ ). Studentov t-test je potvrdio ove rezultate. Ova metoda se može prihvatiti kao način liječenja za djecu u dobi iznad 7 godina.

Ključne riječi: *Ambliopija; Okluzija oka; Školska djeca*